Fundamental Mechanics: Quiz 7

17 October 2016

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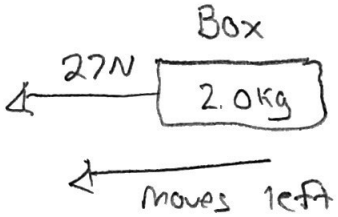
Formulae: $K = \frac{1}{2}mv^2$ $W = F\Delta r\cos\theta$ $W_{\text{net}} = \Delta K$ $g = 9.80\,\text{m/s}^2$

A 2.0 kg box is initially at rest on a horizontal frictionless floor. Subsequently a rope pulls horizontally to the left with a constant force of 27 N and the box moves 3.0 m. Determine the work done by the rope, the work done by gravity and the work done by the normal force. Determine the speed of the box after it has moved 3.0 m from its starting point.

$M = 2.0\,kg$

$F = 27\,N$

$\Delta r = 3.0\,m$



$\Sigma_y = 0$

$\vec{N} - mg = 0$

$\vec{N} = mg$

$F = 27\,N$

$\vec{N} = 19.6\,N$

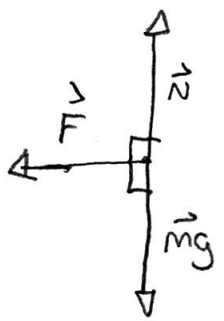
$\vec{F}_G = 19.6\,N$

$W = F\,\Delta r\cos\theta$

Rope $\theta = 0$

$W = 27\,N(3.0\,m)\cos 0$

Rope = 81 J



$t_0 = 0s$ $t_1 =$

$x_0 = 0m$ $x_1 = 3m$

$v_0 =$ $v_1 =$

$a_x =$ a_x

Normal Force $\vec{N} = 19.6\,N$

$W = F\,\Delta r\cos\theta$

$W = 19.6\,N(3.0\,m)\cos(90)$

Normal = 0J

$27\,N = 2.0\,kg(a)$

$a = 13.5\,m/s^2$

$\Delta x = 3.0\,m$

$v_1^2 = v_0^2 + 2a\Delta x$

$v_1^2 = 81$

$v_1 = 9$

Velocity after 3.0m $v_1 = 9\,m/s$

Gravity Force $mg = 19.6\,N$ $\theta = 90$

$W = F\,\Delta r\cos\theta$

$W = 19.6\,N(3.0\,m)\cos(90)$

Gravity = 0J